USE OF CHLORINE DIOXIDE

Rule Affected: Title 30 Texas Administrative Code (30 TAC) §290.42(e)(3)(G)

Background

Chlorine dioxide (ClO_2) is an extremely powerful oxidant that can be used to improve the aesthetic, chemical, and microbiological quality of drinking water. The proper use of ClO_2 can reduce taste and odor complaints, improve iron and hydrogen sulfide concentrations, and improve the coagulation process at surface water treatment plants. It does not form halogenated disinfection by-products such as trihalomethanes and haloacetic acids and is a very effective disinfectant. However, elevated levels of ClO_2 and its principal by-product, chlorite, can have their own adverse health effects. Consequently, the Texas Commission on Environmental Quality (TCEQ) has adopted the following guidance to ensure that only well-operated, high-efficiency ClO_2 generators are utilized by public water systems.

Guidance

1. Before placing a chlorine dioxide generator into service, a Public Water System (PWS) must submit an exception request to the address below:

   Technical Review and Oversight Team (MC 159)
   Texas Commission on Environmental Quality
   P.O. Box 13087
   Austin, Texas 78711-3087

The exception request submittal must include:

a. The name and specifications for the chlorine dioxide generator proposed for use;

b. Information regarding other U.S. potable water installations of the proposed unit;

c. Information on the operation and maintenance training program;

d. The expected total applied dosage of chlorine dioxide and other disinfectants as well as the points of application for all disinfectants and the type and amount of residuals and by-products expected in the distribution system;

e. Name and qualifications of the individual(s) expected to perform routine analytical efficiency testing. [Laboratory testing must be completed by a trained plant operator who holds a Class C or higher water works license.];

f. A description of the containment facilities for the sodium chlorite tanks. Containment facilities for a single container, multiple containers, or interconnected containers must be large enough to hold the maximum amount of chemical that can be stored with a minimum freeboard of six vertical inches or to hold 110% of the total volume of the container(s), whichever is less, as specified in 30 TAC §290.42(f)(1)(e)(ii)(1); and

g. The chlorine gas equipment must have a capacity of at least 50% greater than the highest expected dosage to be applied at any time as specified in 30 TAC §290.42(e)(3)(A).

2. Upon receipt of the exception approval to use a chlorine dioxide generator, sealed, signed, and dated engineering plans and specifications are required to be submitted for review and approval prior to construction for any additional equipment for which the facility has not received previous TCEQ approval, as specified in 30 TAC §290.39(j)(1)(A). Plans and specifications must be submitted to the address below:

   Plan Review Team (MC 159)
   Texas Commission on Environmental Quality
   P.O. Box 13087
   Austin, Texas 78711-3087

   Please include with the submittal a copy of this staff guidance document and a completed TCEQ Plan Review Submittal Form[i].

3. Upon the exception approval for the use of a chlorine dioxide generator, the system will receive a ClO_2 Verification Form from the TCEQ. Once all employees at the system who will handle and/or conduct the mandatory chlorine dioxide and chlorite testing have been properly trained on the production and testing equipment, this form must be signed by a manager or the chief operator in charge and returned to the TCEQ Technical Review and Oversight Team (see exception letter for mailing instructions).

   a. The PWS must keep an updated copy of the ClO_2 Verification Form (including future employee trainings) in their files for as long as the system utilizes a chlorine dioxide generator, and present this information to TCEQ staff upon request.

   b. A PWS, which does not use chlorine dioxide for disinfection, can utilize ClO_2 generators once ClO_2 Verification Form is submitted to the TCEQ's Technical Review and Oversight Team.

   c. The TCEQ will retain the original ClO_2 Verification Form in the exceptions public folder with the label "Exception_VF."

4. ClO_2 for disinfection: Before placing any treatment plant in service with chlorine dioxide disinfectant, a calculated disinfectant concentration time (CT) analysis must be performed to demonstrate that each surface water treatment plant can achieve a 2.0-log removal or inactivation of *Cryptosporidium* oocysts, a 3.0-log removal or inactivation of *Giardia,* and a 4.0-log removal or inactivation of viruses.

   The revised CT study must be submitted to:

   CT Study Program Coordinator
   Technical Review and Oversight Team (MC-159)
   Texas Commission on Environmental Quality
   P.O. Box 13087
   Austin, TX 78711-3087

   The CT study template can be downloaded at the TCEQ website[ii].

All systems using ClO_2 **as a disinfectant or just for process treatment** must complete and submit a Chlorine Dioxide Monthly Operating Report (ClO_2MOR). The Chlorine Dioxide MOR (TCEQ-0690) is an Excel97 spreadsheet that automatically performs calculations. An electronic copy ,as well as the instructions for completing the ClO_2MOR, can be downloaded at the TCEQ website[iii]:

Please note that per 30 TAC §290.110 and §290.114, the following monitoring requirements are imposed on all systems using chlorine dioxide:

a. The system must complete a ClO_2MOR for each entry point supplying water with chlorine dioxide to the distribution system. If all of the treatment plants utilizing ClO_2 lead to the same entry point, then the system will only have to fill out one ClO_2MOR per month. If a system has multiple plants utilizing CLO_2 and the effluent from each plant flows to the distribution system through a different entry point, the system will need to complete a ClO_2MOR for each entry point from each plant.

b. Per the ClO_2MOR instructions, the system must perform the following sampling for each entry point through which water containing chlorine dioxide flows:

   The system must collect one sample per day from the point of entry (POE) to be analyzed for ClO_2. If the ClO_2 residual is exceeds 0.8 milligrams per liter (mg/L) at the POE, the system must collect three samples from the distribution system to be analyzed for ClO_2. The locations and timeframes for the collection of these samples can be found in the *Summary of Additional Monitoring and Reporting Requirements for Public Water Systems Using Chlorine Dioxide.* This document is included in the letters to systems granting exceptions for the use of chlorine dioxide.

   The system must collect one sample per day from the POE to be analyzed for chlorite. If the chlorite residual exceeds 1.0 mg/L at the POE, the system must collect three distribution samples within 24 hours and have them analyzed for chlorite. The locations for these sample collections can be found in the *Summary of Additional Monitoring and Reporting Requirements for Public Water Systems Using Chlorine Dioxide*.

   The system must also collect three samples in the distribution once a month to be analyzed for chlorite for every POE that supplies water treated with chlorine dioxide. One of these sample points must be near the first customer of a plant, at a location representative of the average residence time, and at a location representative of the maximum residence time. These samples are known as a three-sample set and must be collected on the same day. The chlorite distribution samples should be collected on a day when chlorine dioxide is used in the treatment process.

5. The system must ensure water operators maintain a free chlorine residual of at least 0.2 mg/L or a chloramine residual of 0.5 mg/L (measured as total chlorine) in the far reaches of the distribution system at all times as specified in 30 TAC §290.46(d)(2). The chlorine dioxide residual of the water entering the distribution system must not exceed a maximum residual disinfectant level (MRDL) of 0.8

mg/L. The chlorite concentration residual of the water entering the distribution system must not exceed a MRDL of 1.0 mg/L.

6. The system must comply with the chlorine dioxide and chlorite monitoring requirements detailed in the *Summary of Additional Monitoring and Reporting Requirements for Public Water Systems Using Chlorine Dioxide* document.
7. The system must develop and submit a revised "Monitoring Plan" that includes the chlorine dioxide and chlorite monitoring locations as required in 30 TAC §290.121. Further information can be found in Regulatory Guidance (RG) 384 "How to Develop a Monitoring Plan for a Public Water System" and at the TCEQ's website[iv]:

   Please submit an updated monitoring plan to the address below:

   Monitoring Plan Coordinator (MC-155)
   Texas Commission on Environmental Quality
   P.O. Box 13087
   Austin, TX 78711-3087

9. The system must identify the location of the reduced-pressure zone backflow prevention assemblies to be installed on the potable water feed line(s) for the chlorine dioxide. Make-up water supply lines to chemical-feeder solution-mixing chambers shall be provided with an air gap or other acceptable backflow prevention device, as specified in 30 TAC §290.42(d)(2).
10. Amperometric titrators must be equipped with platinum-platinum electrodes as specified by the requirement in 30 TAC §290.110(d)(5).
11. The system shall ensure that the gas chlorination facility meets the applicable requirements listed in 30 TAC§290.42(e) and (f). All chemical storage and feed facilities must comply with 30 TAC §290.42(f).
12. All chemicals used in the generation of chlorine dioxide must conform to NSF International Standard 60 and be certified by a testing organization accredited by NSF as specified in 30 TAC §290.42(j).

Finalized and Approved by:

5/7/18

Joel Klumpp, Plan and Technical Review Section Manager, 05/07/2018

If no formal expiration date has been established for this staff guidance, it will remain in effect until superseded or canceled.

Revision History:

Date	Action	Action by
9/8/1998	Approved	Charles Maddox
6/3/2013	Revised	Sylvana (Sam) Turner
09/4/2013	Revised	Joel Klumpp
09/20/2013	Revised	Ada Lichaa
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10/26/2015	Revised	Mia Gonzales
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08/23/2017	Revised	Mia Gonzales
3/23/2018	Revised	Sylvana (Sam) Turner
05/07/2018	Approved	Joel Klumpp

[i] TCEQ Plan Review Submittal Form
[ii] Concentration Time Study Template
[iii] The instructions for completing the ClO2MOR
[iv] How to Develop a Monitoring Plan for a Public Water System